Air Force Association
Firebee/Firebee II Presentation

Historical Background

The Firebee program began in 1947 with the development of the XQ-2, under Air Force management. The Operational Suitability Tests were done at Holloman.

An improved version, the Q2A, was placed in the Air Force inventory in 1955. This model Firebee operated at Vincent, Eglin, Tyndall and Holloman Air Force Bases. As a matter of fact, we still fly a few Q2A's at White Sands Missile Range, which is quite a tribute to the reliability of that model.

In response to the Air Force requirement for higher performance the Q-2C was developed. It has been in the Air Force inventory since 1959 and is now designated the BQM-34A. This model provides efficient and reliable service for weapon system and aircrew evaluations to Holloman and Tyndall. To recap Ryan's target drone experience: Since 1947, more than 2,600 Firebees have been delivered to the military services with nearly 10,000 flights on the record.

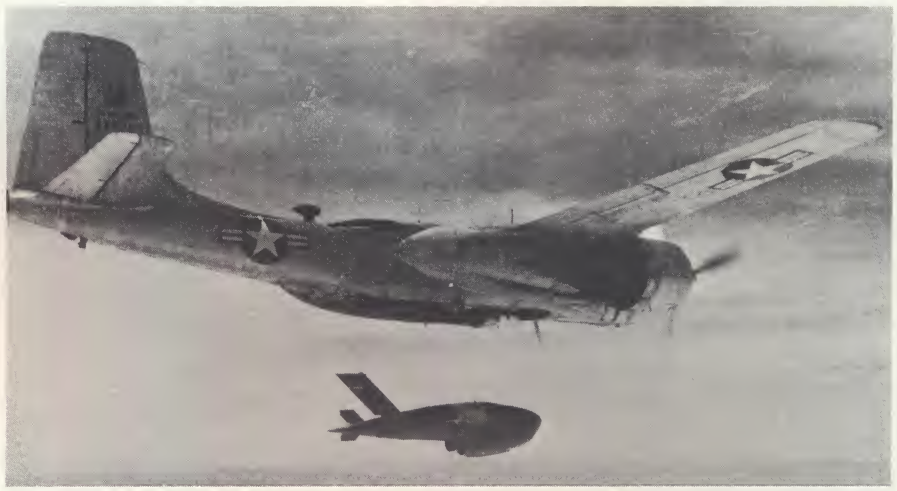
Demonstrated Performance

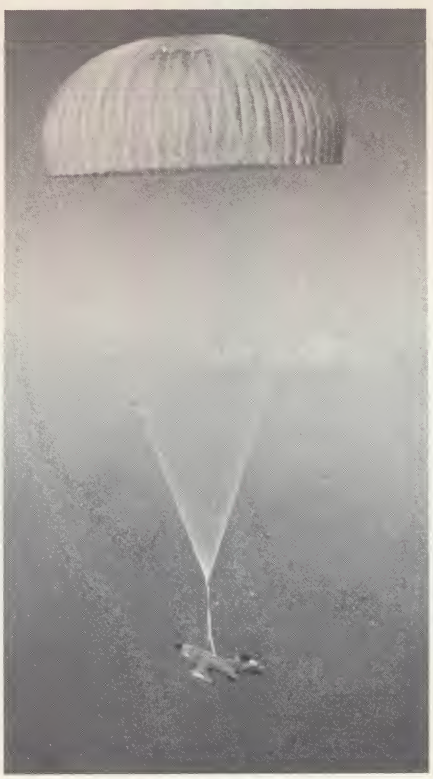
Now let's take a closer look at the BQM-34A. This is the high subsonic speed target that has a maximum speed of Mach .96.

It has flown at 50 feet above terrain and as high as 61,000 feet.

Its longest duration flight to date is 1 hr., 52 min.

The BQM-34A was designed to float for 1 hour. As a matter of interest, a Firebee was recently retrieved after being afloat for 2 years.





Operational Flexibility

In addition to providing desired performance, the Firebee must be usable in the operational environment. The Firebee does have this flexibility. For example, it may be air launched from a GC-130 Hercules aircraft . . . or ground launched from a zero-length launcher with rocket assist.

When the mission is over, Firebee is recovered by a two-stage parachute system . . . and retrieved from water by helicopter or boat or from land by helicopter or truck.

A new recovery method, recently developed and proven highly successful is the Mid-Air Retrieval System (MARS). Simply by engaging a drogue chute attached to a load line, the Firebee is retrieved in mid-air by a specially fitted helicopter. This eliminates problems caused by salt water contamination or land impact damage.

I would like to point up what I have said about performance and operational flexibility by mentioning that Firebee is the only jet powered (aerial) target system used for the William Tell weapons competitions since they began in 1958.

I believe our record of performance and reliability during William Tell 1965 bears this out. During this event, Ryan and Air Force personnel prepared and launched 46 Firebees in six days. To do this took a superior performance by launch crews and maintenance people. Their performance was so excellent that we were able to fly one Firebee six times in five days. This is a real tribute to the Drone Squadrons at Tyndall.

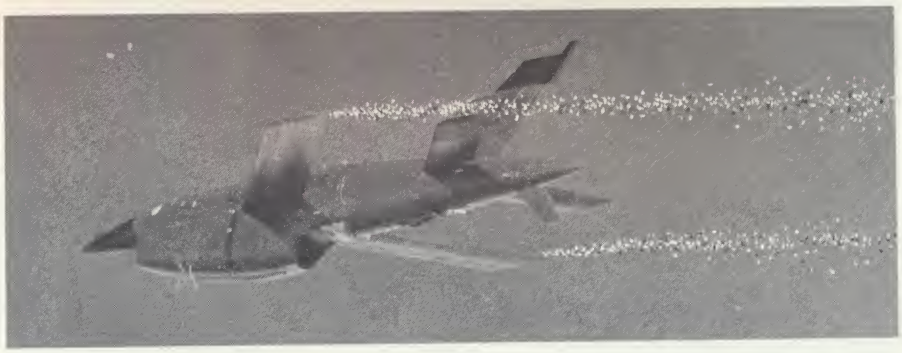
Simulating the Threat & Realism

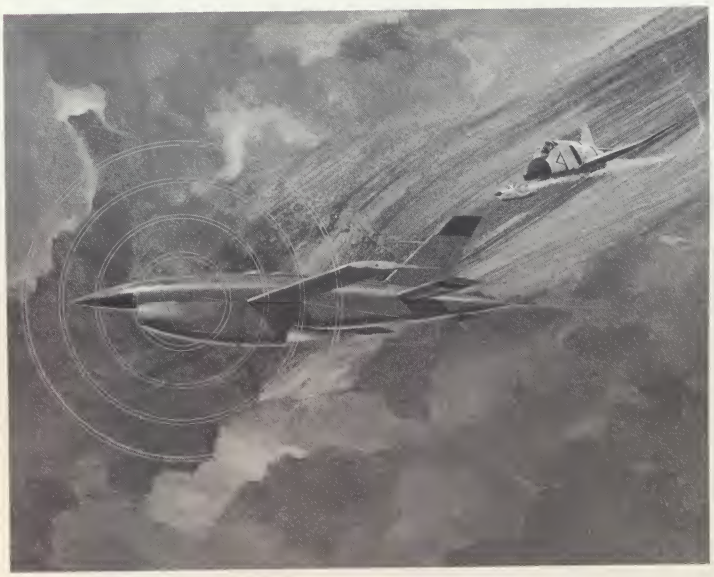
Now, as proud as we are of the Firebee's performance and operational flexibility, we feel that the key to target success lies in our ability to simulate the threat. We feel that Firebee does just this. And in a highly realistic manner. Now let's examine some of the ways this is done.

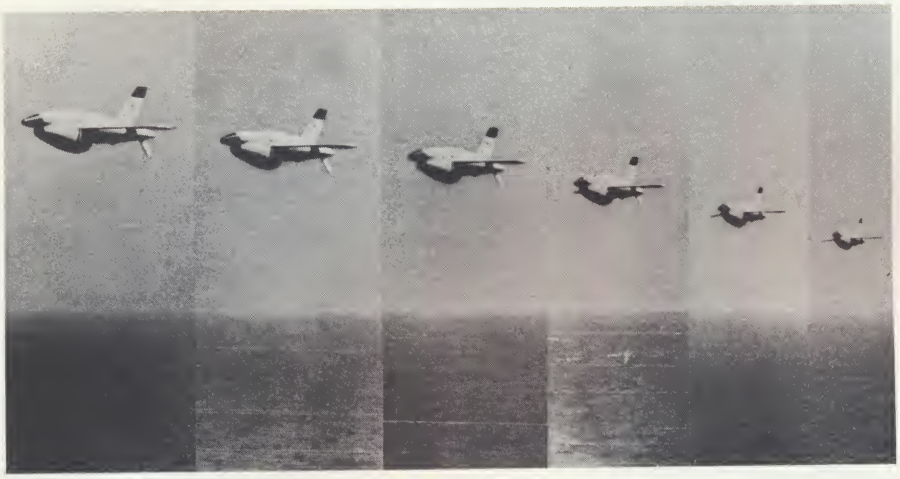
Because the bare Firebee has a small radar return, we have augmented it with a Traveling Wave Tube. This electronically adjusts the size of the Firebee to resemble any target up to and including large bombers.

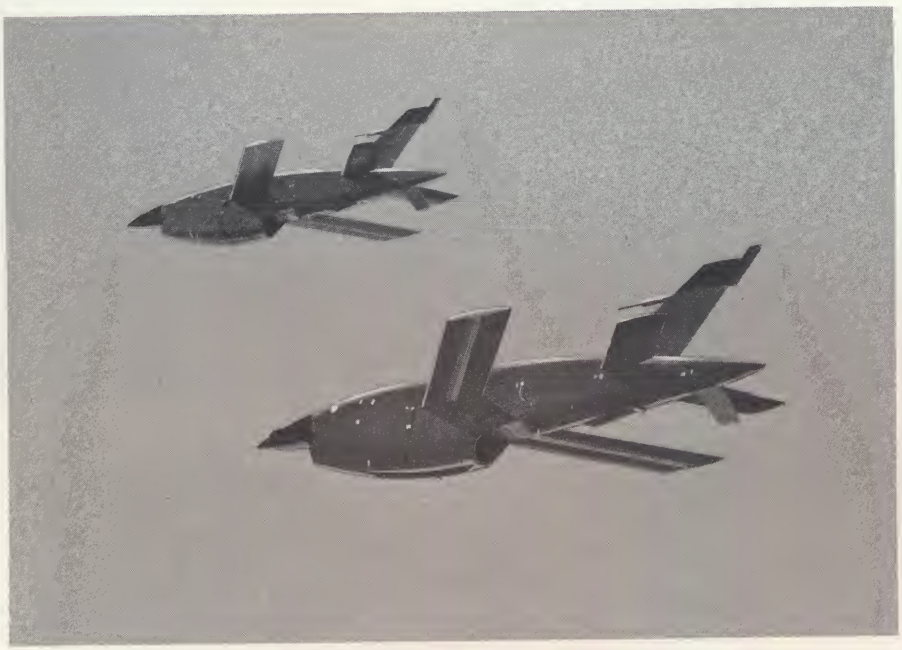
To simulate smaller fighter type aircraft we use passive augmentation such as corner reflectors or a Luneberg lens. Infrared signatures of enemy threats are simulated by infrared flares or heat sources mounted on the Firebee wingtips. To increase the realism, we also employ ECM techniques. We fly deception-type and/or noise jamming devices in the Firebee. Passively, we deploy chaff both from wingtip rockets or from variable quantity dispensers in the wings.

With today's headlines pointing out an urgent need for a maneuvering target for missile evaluation and aircrew training, the Firebee has been modified recently with an Increased Maneuverability Kit. This kit provides a sustained level turn capability of 4 g's at 25,000 feet. More than 50 of these IMK kits are now being procured to support two Air Force missile evaluations scheduled to begin shortly.









The possibility of low-flying enemy aircraft penetrating our defenses is another ever-present threat. To provide simulation of this threat, two different production kits are currently available that give the Firebee an "on-the-deck" capability.

The Barometric Low Altitude Control System, BLACS, provides descent to 150 feet and maintains level flight at this altitude.

Radar Altimeter Low Altitude Control System (RALACS) descends to and maintains a 50-foot altitude. Both these systems are fully automatic and can be flown by any experienced remote control operator.

I want to point out that all these capabilities have been thoroughly developed and flight proven. They are in the inventory and are available.

We have another capability in development which holds great promise. Right now we are working at White Sands Missile Range to develop a system to fly two Firebees in formation. We expect to provide this formation capability in support of a missile evaluation program next month.

Missile Compatibility

Because of its versatility, adaptability and realism, the Firebee has been used for research and development and test and evaluation of nearly every surface-to-air and air-to-air missile system developed by the military services.

The Firebee family has played an important part in the development of our air defense systems and is now assuming an equally important role in support of our tactical forces. Firebees are currently being used by Tactical Air Command to support Sparrow and Falcon evaluation programs and to provide realistic aircrew preparation prior to their overseas deployment.

You have seen how Ryan continually tries to stay ahead of the game, by keeping abreast of the threat and your requirements, so we can give you a realistic target system that is usable.

In line with this philosophy, and in response to expanding requirements, we are now building a new generation of Firebees . . . the Firebee II, or XBQM-34E, which puts the Firebee in the supersonic regime.

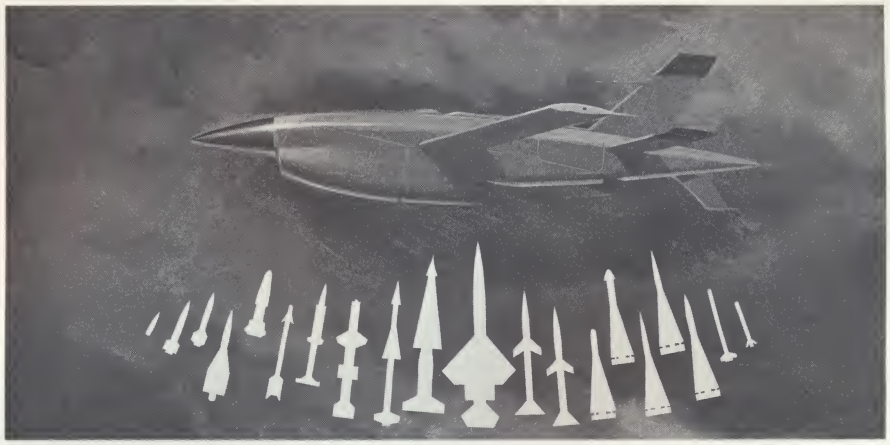
Ryan is under contract to the Navy to build and flight test four prototype (systems) and one static test vehicle. An additional quantity of ten prototypes are also being procured by the Navy for further user evaluation.

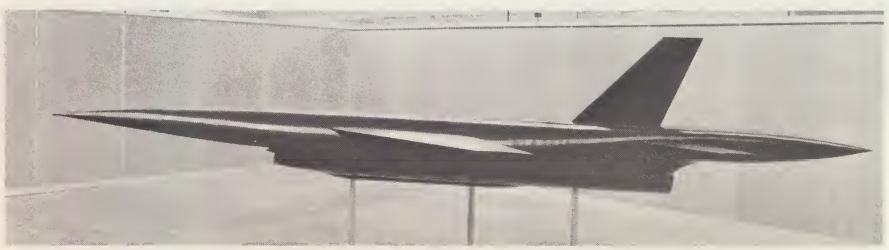
This supersonic target system provides an added benefit to the user. Not only does it still maintain the performance, operational flexibility and threat realism of the BQM-34A, but the capabilities developed in kit form to enhance versatility of the BQM-34A are now inherent in the Firebee II.

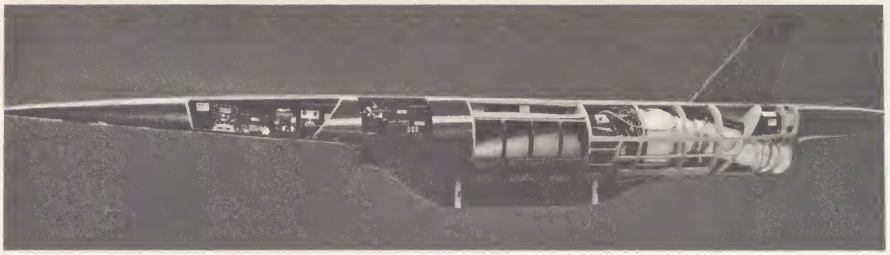
Now let's look at the XBQM-34E.

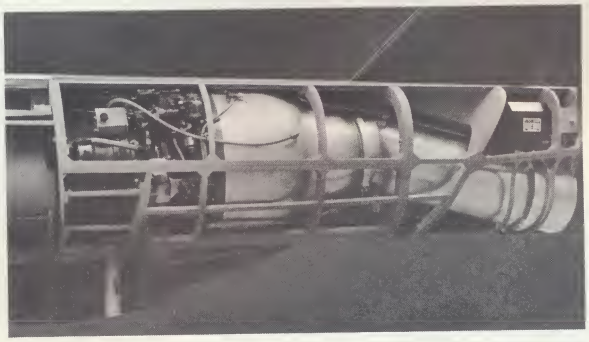
Design Characteristics

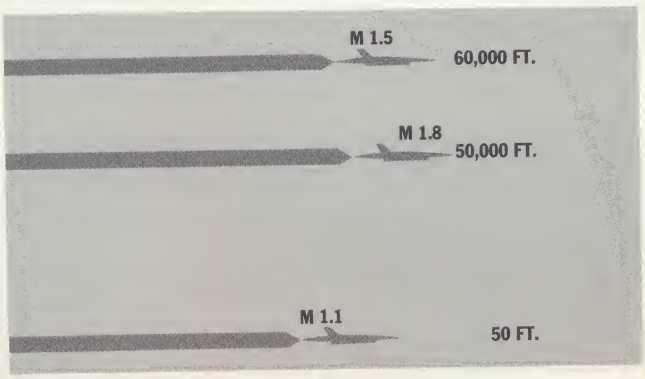
- Retains equipment carrying capability and mission performance of existing BQM-34A
- Air or ground launch
- Incorporates growth potential











The basic design characteristics specified that the Firebee II use existing BQM-34A systems, subsystems, components and equipment wherever possible. This represents a real saving in cost.

That it retain the equipment-carrying capability and mission performance of the existing BQM-34A. That it be air and ground launchable and finally, that it incorporate growth potential.

These program objectives are achieved by using a modified Continental J69-T-29 engine with a new supersonic airframe. Continental modified the engine accessory and compressor section and also uprated the engine from 1700 to 1840 # SLST.

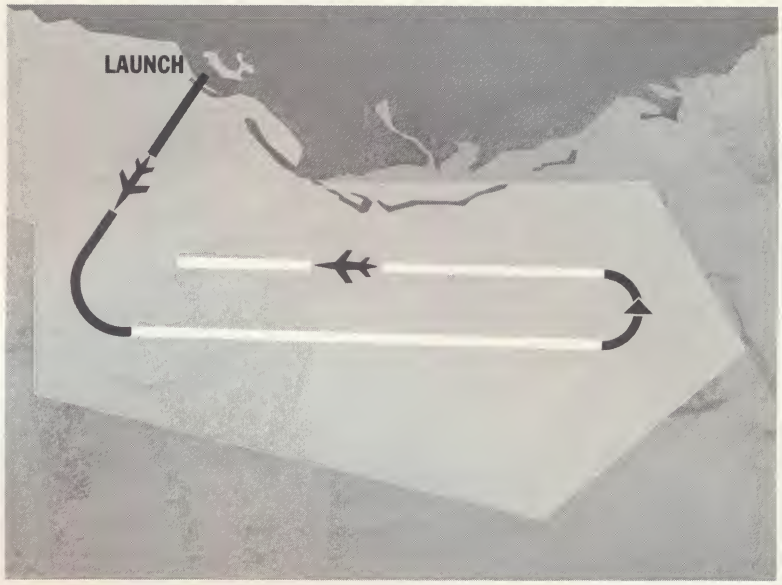
The Firebee 2 is about 5 feet longer and has a 4-foot narrower wing span than the BQM-34A. There are no ailerons on the wing. The horizontal tail surfaces move conventionally for pitch and differentially for roll.

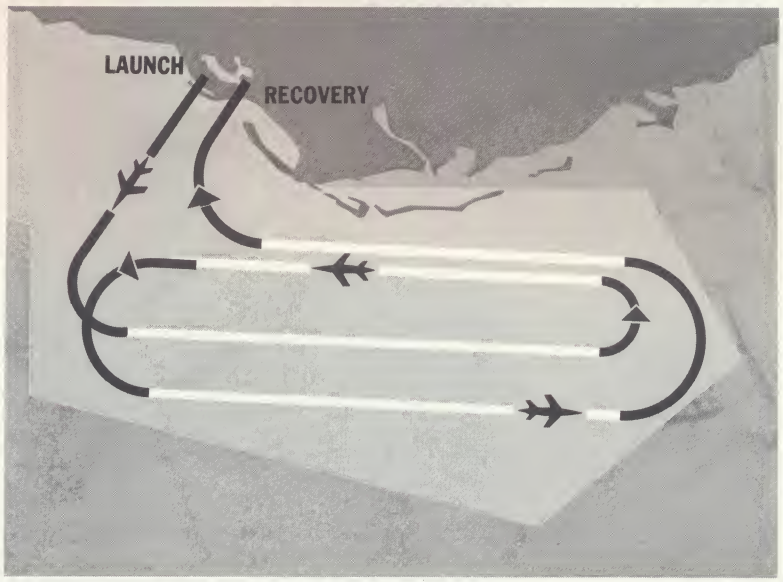
To perform its supersonic mission, fuel is carried internally. However, for added endurance and more range time at subsonic speeds, an additional 400 pounds of fuel is carried in an expendable jettisonable fuel pod. When the pod is attached, it is in a subsonic configuration.

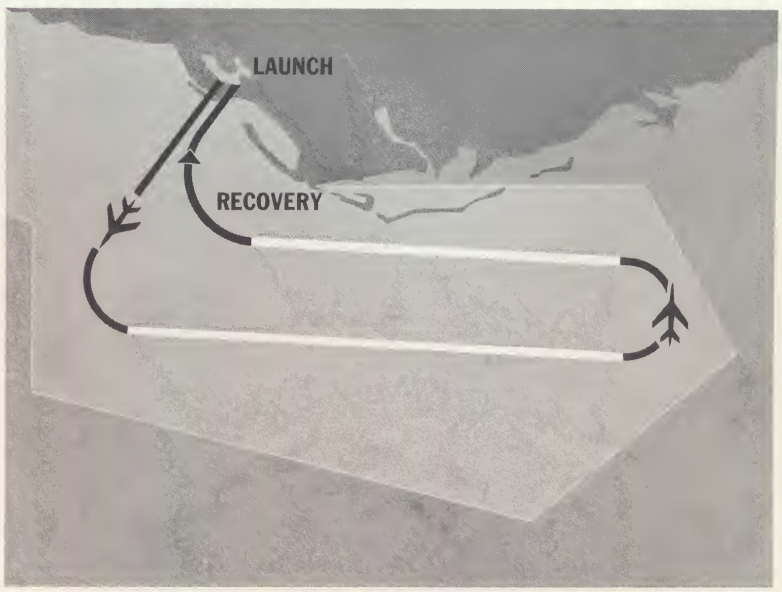
With the pod attached, the performance of the BQM-34A is essentially duplicated. In the clean configuration, the Firebee II operates at M 1.1 on the deck; M 1.8 in the 50,000-foot altitude range, and M 1.5 above 60,000 feet. Using our performance data, we have developed some representative mission plots which could be used by the Air Force on an overwater firing range.

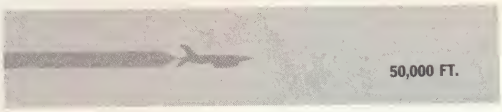
For this mission, with the external pod attached, the Firebee II climbs, levels at 50,000 feet, and cruises for 30 minutes at M .9 providing two long hot legs; then dropping the pod, it climbs while accelerating through M 1.5 and provides 20 minutes at 60,000 feet at M 1.5, or two hot legs. In this case the last leg is shortened to allow for pinpoint recovery over land. The total mission time is 75 minutes.

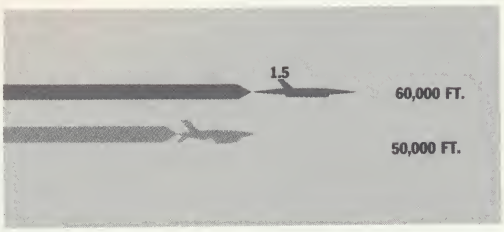
For the low altitude requirement this type of mission can be flown: With the pod on, the Firebee II is leveled at 500 feet and cruises at M .8 for 18 minutes providing two hot legs; the pod is then dropped and the Firebee II, using the automatic low altitude system, descends and levels at 50 feet above the deck, providing a supersonic dash at M 1.1 for 5 minutes.

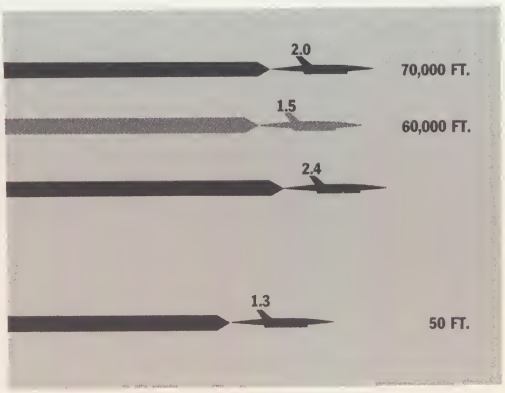


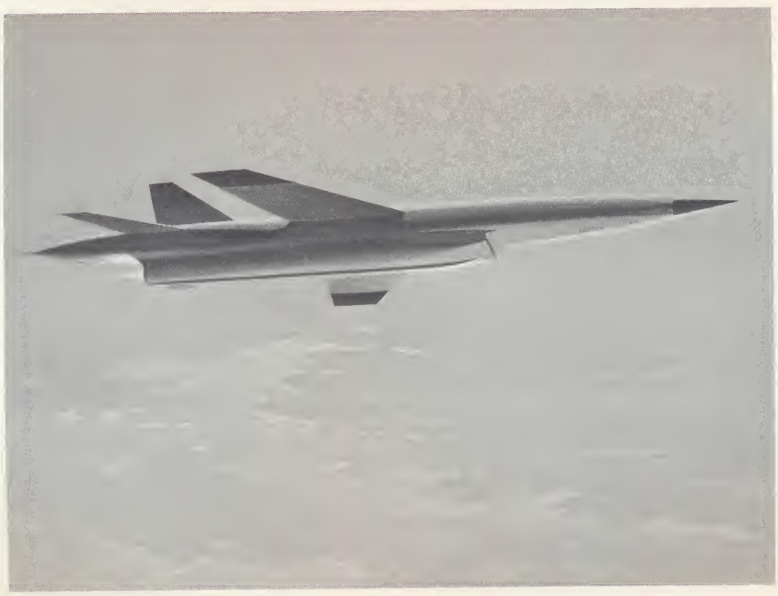












Naturally different missions plots can be developed for various firing ranges and different operational requirements.

In anticipation of the enemy threat, the airframe and flight control system were designed to provide a maneuvering capability that exceeds the specification requirement. The Firebee II will be capable of 5g turns at low altitude.

To be noted, the BQM-34A was designed for 500 knots TAS at 50,000 feet, and this specification has been exceeded.

The XBQM-34E will provide M 1.5 at 60,000 feet. However, the airframe, flight control system and subsystems were designed and are being built to incorporate the proposed Continental growth engine. With 2980 pounds thrust, the growth version of the XBQM-34E will be capable of operation at M 1.4 on the deck; M 2.5 in the 50,000-foot altitude range and M2 at 70,000 feet.

In summary, Ryan is utilizing the design concepts of the BQM-34A together with its 18 years of drone experience to build a target system for the Navy that has widespread application for all services. It is both subsonic and supersonic, capable of high and low altitude, realistically maneuverable, reusable and will satisfy tomorrow's requirements.

- ***SUBSONIC / SUPERSONIC***
- ***HIGH ALTITUDE / LOW ALTITUDE***
- ***MANEUVERABLE***
- ***REUSABLE***

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LINDBERGH FIELD / SAN DIEGO, CALIFORNIA 92112

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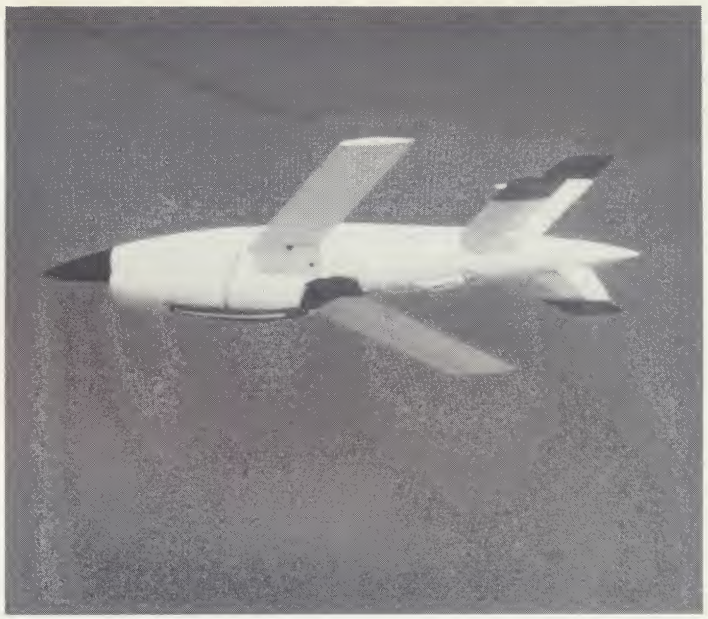
Firebee Target

Firebee Target



High performance Firebee roars over target range.

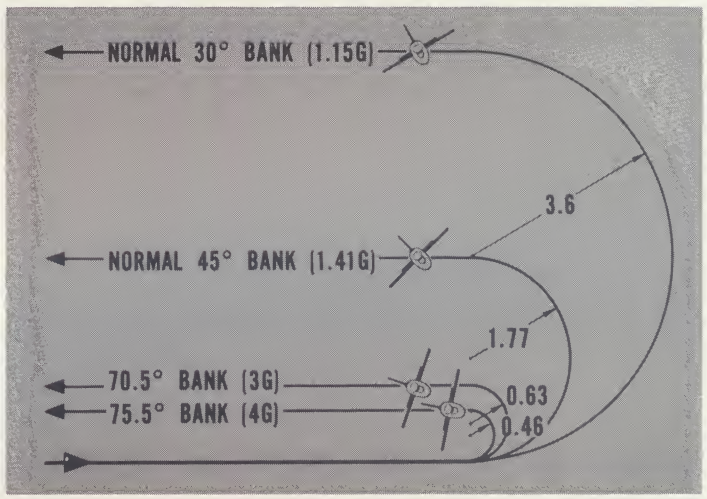
Introduction

Ryan's jet-powered, swept-wing BQM-34A Firebee is a pilotless, recoverable aircraft of advanced design. It is remotely controlled by radio through all normal flight maneuvers. A radar beacon is employed for tracking. Telemetry, when desired, supplies in-flight data to aid the remote control operator.

Major subsystems include the power plant, autopilot, command control and stabilization and remote control and tracking. Systems are available for low-altitude and programmed flight.

As a complete training and weapons evaluation system, the Firebee also carries target augmentation devices to meet varying mission requirements. In addition, there is equipment to facilitate landing and recovery when a mission is completed.

Current production Firebees include two versions: BQM-34A (formerly Q2C) for the U. S. Air Force and U. S. Navy and MQM-34D for the U. S. Army.



Performance and Specifications

The Firebee's demonstrated capabilities exceed design objectives. It has attained a speed of Mach .96, has climbed to more than 60,000 feet and cruised as low as 50 feet. The speed range of the Firebee is from 200 knots to in excess of 600 knots. It has set an endurance mark of 115 minutes.

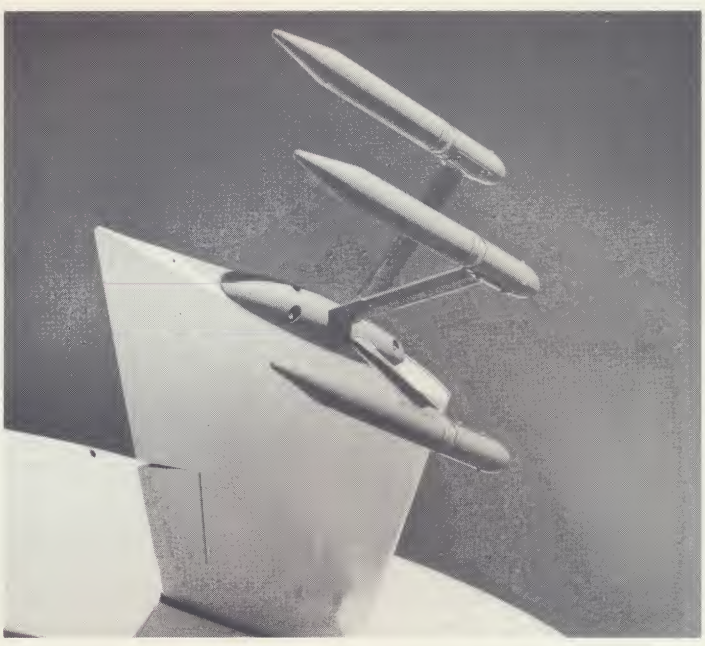
The Firebee has flown more than 200 miles from its control site, and has flown for more than 77 minutes above 50,000 feet.

Normal gross weight is approximately 2,100 pounds. Length is 22.9 feet, height 6.7 feet and wing span of 12.9 feet. Rated thrust of the Continental J69-T-29 jet engine is 1,700 pounds at sea level.

Flight Control and Stabilization

The flight control subsystem automatically stabilizes the Firebee and executes flight maneuvers upon command from the remote radio control site or from a self contained pre set flight programmer.

Significant operational features include automatic scheduling of bank angles as well as dive, climb, and glide speeds to obtain optimum performance and to ensure structurally safe flight maneuvers.



Wing-tip infra-red flares augment Firebee target presentation.

Ralacs Firebee at 60 ft. altitude during "hot run" presentation (sequential high-speed photos).

Maneuverability
An increased Maneuverability Kit, which makes the Firebee capable of 4 'g' turns at altitudes up to 25,000 feet and 3 'g' turns at altitudes up to 40,000 feet, is available to military users. The kit may be field retrofitted or installed during factory production.

Low Altitude Systems
Firebees have been flown as low as 50 feet to demonstrate their capability as challenging targets. Two Ryan-developed systems are available for such missions.
The Barometric Low Altitude Control System (BLACS) provides an automatic altitude control capable of operation down to 150 feet.
Using the Radar Altimeter Low Altitude Control System (RALACS), the target is controlled automatically at a pre-set altitude within the range of 50 feet to 4,000 feet. Altitude accuracy is maintained by a radar altimeter.

Target Acquisition & Augmentation
Firebees employ a variety of target augmentation devices and techniques to enable them to meet varying mission requirements and to aid in weapons system evaluation. Flares mounted on each wingtip, provide the infrared energy of "enemy" aircraft engine heat.
Their wingtip positions reduce the probability of target destruction by heat seeking missiles
Due to the relatively small size of the Firebee, its radar reflectivity is augmented to simulate the size of actual threat aircraft. An active radar augmentation system is installed and regulated to meet specific requirements.
Radar signal amplification by a Ryan-developed travelling wave tube augmentation system in the target provides a controllable radar "echo." This enables the Firebee to simulate large aircraft such as enemy bombers as well as smaller fighter type aircraft. It provides much greater acquisition ranges and compatibility with missile systems than would be possible with bare skin tracking.
Passive augmentation, consists of reflectors and/or Luneberg lens of various sizes. These devices provide augmentation for limited attack angles.
In-flight scoring systems are used to evaluate the effectiveness of weapons systems, defense crews, and fighter interceptor pilots.

Countermeasures
To increase realism, the Firebee employs ECM techniques. Deception-type and/or jamming and noise devices are flown in the Firebee. Passive ECM deployment of chaff is accomplished from wing mounted dispensers or from forward firing chaff dispensing rockets mounted on the wingtips.

Recovery
The Firebee's automatic glide capability enables the remote-control operator to maneuver it to a suitable recovery point when a mission is completed or fuel is depleted. A two-stage parachute system ensures a safe landing impact. Standard airborne or surface equipment may be used to retrieve the Firebee after parachute recovery.

Re-Use
Rugged high-strength metal construction, combined with reliability of the recovery and retrieval systems give the Firebee an outstanding longevity record. Firebees are returned to service repeatedly, following rapid decontamination and refurbishment.

After landing, Firebee can be quickly retrieved, refurbished, and returned to service.

Field Service and Support. Ryan can furnish complete Firebee operational and field service at any military installation in the free world. Its field crews provide contractor-operated services for the Navy at Roosevelt Roads, Puerto Rico, and for the Army at the White Sands and McGregor Missile Ranges, N.M. Ryan also provides field service and support for the Air Force's William Tell weapons meets at Tyndall AFB, Fla. Company target technicians have served the Air Force at Holloman AFB, N.M.

Experienced Ryan on-site technicians have assisted in target operations at numerous Naval installations. These include the Navy Missile Center, Point Mugu, Calif.; Naval Ordnance Test Station, China Lake, Calif.; North Island Naval Air Station, San Diego; the Naval Air Facility, Naha, Okinawa; and the Cubi Point Naval Air Station in the Philippines.

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